## REMARKS

Claims 1 through 9 are currently pending in the application.

This amendment is in response to the Office Action of June 13, 2002.

Claims 1 through 9 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Watts, Jr. et al. (U.S. Patent 6,276,589 B1).

Claim 8 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Watts, Jr. et al. (U.S. Patent 6,276,589 B1) as applied to claim 1 above, and further in view of Smith et al. (U.S. Patent 5,560,543).

Applicant has amended claims 2, 4 and 5 herein.

Applicant further submits that to establish a *prima facie* case of obviousness under 35 U.S.C. § 103 three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Third, the cited prior art reference must teach or suggest all of the claim limitations. Furthermore, the suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on Applicant's disclosure.

Watts, Jr. et al. describes a jet soldering system including a solder ejector 12 for providing a continuous stream of charged solder droplets 14, deflecting plates 16, 18 for passing the charged solder droplets through to a gutter 20 or deflecting the droplets towards a substrate and an x-y translation table on which the substrate is mounted (Fig. 1, col. 3, lines 43-48 and col. 4, lines 17-21). The ejector 12 includes heaters 32, 34 to melt solder in a cartridge 77 contained therein, a gas pressure line 44 for pressurizing the molten solder and a piezoelectric vibrator 31 to produce a standing wave in the stream of solder leaving the ejector (col. 3, line 54 - col. 4, line 5).

Regarding independent claim 1 of the present application, Applicant respectfully submits there in no suggestion or motivation in the cited references or from the knowledge generally

available in the prior art which would lead one of ordinary skill in the art to modify Watts, Jr. et al. as suggested in the Office Action to establish a *prima facie* case of obviousness under 35 U.S.C. § 103 with respect to the claimed invention. Watts, Jr. et al. fails to disclose the limitations set forth in claim 1 calling for "selectively directing said stream of liquid solder metal droplets in a first dimension and a second dimension" and "deflecting said electrically charged stream of liquid solder metal droplets in said first dimension and said second dimension". It was asserted in the Office Action that one of ordinary skill in the art would have been motivated to deflect the solder droplets of Watts, Jr. et al. in two dimensions as opposed to only one because the need for substrate movement would be eliminated and droplet placement would be more easily and accurately controlled. Applicant respectfully disagrees.

First, there is no suggestion in the reference to support this conclusion and no other evidence has been presented to indicate it would have been obvious *at the time of the invention* to make the modification. "The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification. *In re Gordon*, 733 F.2d at 902, 221 USPQ (Fed. Cir. 1984). Rather, Applicant submits the reasoning for such modification as suggested in the Office Action appears to be drawn directly from Applicant's instant disclosure and is impermissible hindsight. See M.P.E.P. 2141.01(III). The Federal Circuit has repeatedly cautioned against employing hindsight by using the applicant's disclosure as a blueprint to reconstruct the claimed invention out of isolated teaching of the prior art. See, e.g., *Grain Processing Corp. v. American-Maize Prods. Co.*, 5 U.S.P.Q.2d 1788, 1792 (Fed. Cir. 1988).

Secondly, there is no reasonable expectation that this modification would be successful to establish a *prima facie* case of obviousness under 35 U.S.C. § 103 regarding the claimed invention. As previously discussed, Watts, Jr. et al. uses deflecting plates 16, 18 for passing the charged solder droplets through to gutter 20 or deflecting the droplets towards the substrate. In other words, solder droplets are ejected at a point directly above the gutter 20 and must be deflected along the Y axis toward the substrate (Fig. 1 and col. 4, lines 24-27). If the substrate

movement capabilities were eliminated as suggested in the Office Action, any locations on the substrate residing below the gutter 20 would be blocked from the solder droplets. Accordingly, the system of Watts, Jr. et al. would be severely limited in solder droplet depositing area, or would require major structural changes to gutter 20 that are not contemplated by the reference.

Applicant respectfully submits the rejection of claim 1 fails to establish the requisite motivation or expectation of success to establish a *prima facie* case of obviousness under 35 U.S.C. § 103. Accordingly, claim 1 is therefore allowable under the provisions of 35 U.S.C. § 103(a). Claims 2 through 9, in depending from claim 1, are also allowable. If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

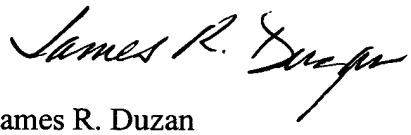
Applicant further submits Watts, Jr. et al. fails to teach or suggest all of the claim limitations of such claims to establish a *prima facie* case of obviousness under 35 U.S.C. § 103 regarding the presently claimed invention. Claim 2, as presently amended, recites the limitation of "controlling a temperature of said stream of liquid solder metal droplets in said liquid state while selectively directing said stream of liquid solder metal droplets." Watts, Jr. et al., on the other hand, is limited to heaters 32, 34 which only melt solder within cartridge 77 and do not control the temperature of the stream of solder droplets once they are released from ejector 12. Claims 4, as amended, recites the limitation "wherein said pressure inducing step is generated by a first piezoelectric crystal" and claim 5, as amended, recites "wherein said vibrating step is generated by a second piezoelectric crystal." Watts, Jr. et al. does not disclose these limitations but instead uses a gas pressure line 44 for pressurizing the molten solder and a piezoelectric vibrator 31 to produce a standing wave in the stream of solder leaving the ejector (col. 3, lines 54-59 and col. 4, lines 2-5). Claims 5 and 6 further recite the limitation of forming solder droplets having diameters "in the range of 40 microns to 300 microns." The disclosure language cited by the Examiner (Watts, Jr. et al. at col. 6, lines 15-40) is directed to the relationship between the vibration frequency of the piezoelectric vibrator and ejector orifice size, and does not specify a solder droplet diameter as is required by the claimed invention.

Turning to the additional rejection of claim 8, Smith et al. teaches a liquid droplet generator that is suitable for use with high temperature liquids. A charge electrode 24 selectively charges droplets and plates 28 and 29 generate a field to deflect the droplets (col. 8, lines 56-64). Uncharged droplets are caught by a catcher 30 and charged droplets are deposited on a circuit board 38 (col. 8, lines 64-66). Alternatively, charged droplets may be caught by the catcher, and uncharged droplets proceed to the target (col. 9, lines 1-4). Based on this, it was asserted in the Office Action that it would be obvious to deflect charged droplets into the gutter of Watts, Jr. et al. while passing uncharged droplets to the substrate in order to avoid damage by static charge. Applicant respectfully submits this modification has no reasonable expectation of success. Uncharged droplets applied to the substrate would be unaffected by a deflecting field and could therefore not be directed to a specific substrate location. Hence, the substrate itself would have to be moved to position the target location directly under the droplet stream. This however, is contrary to the Examiner's previous line of reasoning, which suggests eliminating substrate movement. Accordingly, the combination of Watts, Jr. et al. and Smith et al. as presented in the rejection would be rendered inoperable for its intended purpose. Furthermore, Smith et al. does not add any teaching or suggestion which would overcome the deficiencies of Watts, Jr. et al. in regard to the claim 1 limitations of "selectively directing said stream of liquid solder metal droplets in a first dimension and a second dimension" and "deflecting said electrically charged stream of liquid solder metal droplets in said first dimension and said second dimension".

In view of the foregoing, Applicant submits the rejection of claims 1 through 9 with Watts, Jr. et al. and the rejection of claim 8 with Watts Jr. et al. in view of Smith et al. fail to establish a *prima facie* case of obviousness under the provisions of 35 U.S.C. § 103(a), and that claims 1 through 9 are clearly allowable over the cited prior art.

Applicant requests the allowance of claims 1 through 9 and the case passed for issue.

Respectfully submitted,



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Enclosure: Version with Markings to Show Changes Made

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## VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

A marked-up version of each of the presently amended claims, highlighting the changes thereto, follows:

2. (Twice Amended) The method according to claim 1, wherein said producing step further comprises:

heating a metal to a liquid state; and

controlling a temperature of said stream of liquid solder metal droplets in said liquid state while selectively directing said stream of liquid solder metal droplets [to maintain said stream of liquid solder metal droplets in said liquid state].

4. (Amended) The method according to claim 3, wherein said pressure inducing step is generated by a first piezoelectric crystal driven by a given frequency to produce a desired pressure.

5. (Twice Amended) The method according to claim [3] 4, wherein said vibrating step is generated by a second piezoelectric crystal driven by a selected frequency to produce a given vibration frequency sufficient enough to form droplets having a diameter in the range of 40 microns to 300 microns.